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ON THE PATHOLOGY OF CERTAIN SO-CALLED UNILOCULAR OVARIAN CYSTS.

By GEO. GRANVILLE BANTOCK, M.D.,
PHYSICIAN TO THE SAMARITAN FREE HOSPITAL.

WHEN, at the February meeting of this Society, in 1872, I took occasion to make a few observations on the specimen of cystic tumour exhibited by Dr. Meadows, I ventured to express the hope that at a future meeting I should be able to lay before you the specimen on which I founded my remarks. Through the kindness of Mr. Spencer Wells I have now the pleasure of placing it before you for inspection. On the occasion adverted to I took exception to the pathological explanation of his specimen offered by Dr. Meadows. In order the more fully to bring the matter before you, I may, perhaps, be allowed to recapitulate his observations. Dr. Meadows believed the specimen to be one of unilocular cyst of the ovary, and he suggested, as the probable explanation, that a Graafian follicle situated in the hilum of the organ had become the seat of cystic enlargement, leaving the remainder of the ovary healthy; and in reply to my objections he supported his views by stating that the microscopical examination of the cyst-wall had presented those structural elements which are supposed to be characteristic of disease of that organ. I shall revert to this hereafter.

Let me first draw attention to the specimen now before you. It consists of the uterus and its appendages as they were removed from the body of a patient *æt.* 16. On careful examination you will perceive that on the right side the ovary is healthy; and on holding up the appendages between you and the light so as to stretch the fold of peritoneum which extends between the ovary and the Fallopian tube, that peculiar organ the parovarium, or organ of Rosenmüller, is plainly seen. At its outer angle, nearest the tube, you will observe a small cyst, about as large as half a fieldbean,

evidently originating in one of the tubules of the organ. (Fig. 1.) This exhibits the first stage in the process of cystic disease. On the left side the ovary is also to be found entire and healthy; and in addition we see a cyst, about as large as the ovary, occupying the same site as the smaller one on the opposite side. On this side the three inner tubules of the parovarium are distinctly visible. It is worthy of note, in passing, that in position the left ovary was completely prolapsed into the left side of the utero-rectal space, evidently pulled down by the weight of the cyst. I may observe that the elegance of the preparation is considerably marred by the action of the spirit in which it has lain for many months, and the cyst does not show the delicate network of blood-vessels which characterised it in its recent state.

I conceive no one who saw it in its fresh state, or may even see it in its present state, will be inclined to object to its being called a non-ovarian cyst, or to doubt that it is a cyst of the parovary.

Little as is the attention which has been devoted to the healthy condition, or anatomy proper, of this body, still less is that which has been given to its morbid state. For the former, half a dozen lines, based on the researches of Kobelt, suffice, in the admirable article of Arthur Farre in the 'Cyclopædia of Anatomy and Physiology.*' After describing its appearance to the naked eye, as viewed between the observer and the light, he says, "The tubes, which contain nothing but a clear fluid, consist of fibrous membrane lined by a single layer of pale, cylindrical, epithelial cells. These tubular canals are not known to have any direct communication with the ovary." Of its morbid anatomy, he says, "So little attention has been given to the structure in its natural condition that accurate information regarding its morbid states can hardly be looked for." The so-called hydatids (of Morgagni) are formed "of the remains of the canals of the retrograde parovarium. Within the walls of these canals is collected occasionally a considerable amount of fluid, and it is probable that this is the

* Article "Uterus and its Appendages," p. 594.

origin of those larger accumulations to which dropsy of the broad ligament has been applied." Dr. West, in his work on 'The Diseases of Women,' has these words in a lecture devoted to the description of the various forms of ovarian cystic disease: "The first kind of simple cyst is one which, though in the immediate vicinity of the ovary, is, strictly speaking, not connected with it; but which I may mention here because, until comparatively recently, its nature was misapprehended, and "erroneous conclusions, based on this misapprehension, have been applied to real ovarian cysts." He goes on to speak of those small delicate cysts, the hydatids of Morgagni, which are often found hanging by a slender pedicle from the edge of the peritoneal fold extending between the Fallopian tube and the ovary, close to the fimbriated extremity of the tube, and containing a transparent, serous, or slightly gelatinous fluid, and of those which bear the same relation to the Fallopian tube, but sessile instead of pedunculated; and he continues, "Sometimes, too, a cyst of larger size may be observed within the folds of the broad ligament situated between the ovary and the Fallopian tube, but obviously not originating in either. . . . The difference of their seat seems to be the only point of dissimilarity between them, for the wall of both is composed of a thin, structureless membrane, incapable of division into layers, often, though by no means constantly, furnished with a lining of nucleated epithelium." I shall show that this statement of incapability of division into layers is not correct in these cysts which have their origin beyond the ovary.

"The size of an egg, an apple, or an orange is the greatest magnitude to which these cysts have yet been proved to attain; and the pendent cysts very rarely indeed reach dimensions sufficient to make them recognisable during life." "A visit to any of the large museums of this metropolis will suffice to convince any one that cysts of the Wolffian bodies of size sufficient to be distinguishable during life are of very great rarity, while the same evidence will also prove that for such cysts to exceed the dimensions of an apple is rarer still.

Whenever, then, a tumour is discovered in the abdomen, which has attained a greater size than that of the doubled fist, that circumstance may be taken as in itself affording almost conclusive proof that the cyst is not extra-ovarian, nor of that kind concerning which it can be foretold that its tendency will be to remain stationary rather than to increase in size." In a preceding sentence Dr. West suggests "the rupture of the delicate walls of both kinds of these growths," as their probable termination. I shall show that these views are inconsistent with known facts, as well as contrary to *à priori* reasoning.

It may not be amiss, at this point, to direct attention to the most recent researches on the anatomy of the parovarium. Dr. Banks, in his 'Prize Thesis' at the University of Edinburgh, as the result of numerous dissections, arrives at the following as one of his conclusions :

"At a certain period, on the summit of the Wolffian body, a new structure forms (supra-Wolffian body), distinct and separate from it, though apparently continuous with it; this structure is a distinct formation, and is not an altered condition of the upper tubules of the Wolffian body. In the male this forms the globus major of the epididymis, and in the female the parovarium."

Hence I use the name *parovarium* instead of *Wolffian body*, and it is a fair assumption that this peculiar body has some function to discharge during sexual activity; while it is worthy of remark that the ovarian cysts occur at the earlier rather than at the later periods of life.

Dr. Graily Hewitt, agreeing in the main with Dr. West, says, "Now and then, however, they attain a large size,"* and in confirmation of this he quotes Mr. Spencer Wells' case (No. 93) as well as one presented to this Society by Dr. Wynn Williams. The latter "was twenty-four inches in circumference." The following is Mr. Spencer Wells' description of the operation:—"The cyst was tapped, easily pulled out, and was found to be rather an offshoot from the right ovary than an ovarian tumour; so much so that I

* 'The Diseases of Women,' 2nd edition, p. 584.

consulted with Dr. Oldham (who was present at the operation) as to the propriety of removing the cyst and leaving the ovary, which it would have been easy to do. But the ovary felt hard," &c. "A cyst the size of a walnut in the left broad ligament near the ovary was laid open and emptied." Dr. Wilson Fox makes the following report on the specimen:—"A large cyst about twice the size of an adult's head. The Fallopian tube, flattened out, is seen to *course along its external surface*. The fimbriæ are, however, non-adherent and distinct. The ovary is found in a fold of the broad ligament, distinct from the tumour and presenting the natural appearance. It contains no cysts. The cyst is lined internally by a flattened polygonal epithelium," and so on. Dr. Fox makes no allusion to the parovarium, the site of which was evidently occupied by the cyst. I may be allowed the supposition that it was of parovarian origin. Beyond the above I find no allusion in any recent work on the subject of ovarian disease to cystic disease of the parovarium. But the records of ovariectomy yield several cases in addition to those quoted, whose description affords unmistakable evidence of similar origin; thus, Dr. Keith reports a case (No. 12), which he calls a "single cyst of the broad ligament coming off close to the uterus." And Mr. Clay, in his Appendix, quotes the following:—"Cyst in the broad ligament half an inch from the left ovary, twenty-four pounds in weight. Ovary healthy and of normal size." This description leaves no doubt that it was a parovarian cyst.

I have said that the literature of this subject is exceedingly meagre. Indeed, the greater number of recent authors altogether ignore this disease, even to the extent admitted by those above named. But it has gone forth, stamped with the high authority of West, that parovarian cysts never attain a greater size than that of an orange, and I cannot allow it to pass without a few words. Assuming, then, the existence of such disease as proved not only by the specimens before you but by previous observation, I must take exception to the argument used by West—viz. that because he

has never seen a cyst larger than an orange, such a thing does not occur; for it must, I think, be allowed that if a cyst in this organ may attain the size of an orange, there is no reason, in the nature of things, why such a size as is within the capacity of the abdomen should not be attainable. In fact, the probability is altogether the other way. It is to be observed also that the specimens examined by Dr. West have probably been obtained from women dying of other diseases at a period when the tumours had not begun to make their presence felt. Had they attained a larger size the patients would have been regarded as the subjects of ovarian disease and would have been treated as such, and if removed by operation the cases would have been described as "unilocular ovarian cysts" or "cysts of the broad ligament." Therefore the argument is a fallacious one, and the foregoing cases furnish conclusive evidence against it.

But we arrive at this conclusion from a consideration of the relations and structure of the cysts. In the first place, holding in view the sessile variety, the cyst is situated between two layers of peritoneum and is abundantly supplied with blood-vessels, whose development keeps pace, according to natural law, with the growth of the cyst. In the second place the cyst is not the delicate structure Dr. West would have us believe. In fact, its walls are of considerable thickness, as can be seen on cursory examination; and as it is an organized structure, deriving its contents from the secreting apparatus with which it is furnished, the cyst-wall keeps pace, in growth, with the increase of secretion, not by distension, like an india-rubber bag, but by growth of similar elements. Hence there is no limit to their dimensions, and the idea of rupture by over distension, as a rule, is utterly untenable.

I now come to the views expressed by Dr. Mcadows:—1st. He suggested that the cyst might have originated at the hilum of the ovary. This is an opinion unsupported by a single reliable observation or by any known fact. In support of this statement I quote the following description of the anatomy and structure of the ovary from the seventh edition

of Quain and Sharpey's 'Anatomy,' vol. ii, pp. 988—9: "Beneath the peritoneal coat, which covers it everywhere *except along its attached border*, the ovary is enclosed in a proper fibrous coat of considerable thickness which adheres firmly to the tissue beneath, being in structural continuity with it. Towards the surface the ovarian tissue, which in this part has been distinguished as cortical, presents, especially in children, a different appearance from the deeper or medullary part, from being granular and having within it great numbers of small vesicles, the Graafian vesicles or follicles, which are *absent from the deeper part*." Such is the description given in our standard work, and it is conclusive against the view taken by Dr. Meadows.

I have quoted the description of the ovary from our standard text-book as that generally accepted, but it is right that I should notice the most recent researches on the subject. I refer to those of Professor Waldeyer, of Breslau, and Dr. Leopold, now of Leipzig. These observers deny the existence of true peritoneum covering the ovary according to the above description. They call attention to the existence of a white line, "the boundary line," bounding the ovary "along its attached border" (distinctly visible in the specimen, No. 1), across which it is impossible to obtain a layer continuous with the peritoneum of the broad ligament and the covering of the ovary. Dr. Leopold says, after having separated a portion of the peritoneum in a delicate thin layer up to the neighbourhood of the hilum it will invariably, in the attempt to continue the separation towards the ovary, tear in a serrated, sharp and straight, or undulating line exactly in the place of the boundary line. Dr. Leopold has also succeeded in demonstrating under the microscope a difference between the epithelium covering the peritoneum and that on the ovarian surface, which is illustrated in the accompanying figures with their explanations attached. I may add that he admits that this demonstration can only be made in the ovary of the young subject, and that at an advanced age it is impossible to indicate these peculiarities, probably from the changes which the ovarian

surface has undergone through the repeated rupture of Graafian follicles.

I assume then as a fact that the hilum of the ovary does not contain Graafian follicles nor the elements of cystic degeneration; and it is contrary to a physical law that a Graafian follicle should find its way through the firm fibrous tissues characteristic of that portion into the loose connective tissue between the layers of the peritoneal fold in which the parovarium lies, in the direction of greatest resistance, instead of towards the surface of the ovary. It is also, at the least, extremely improbable that in conjunction with such a cyst, assuming its possible existence, the remainder of the ovary should remain healthy.

2ndly. Dr. Meadows supported his views against my objections by stating that, on microscopical examination, a portion of the cyst-wall presented those elements which one would expect to find in an ovarian cyst. But we have seen that the tubules are lined by epithelial cells, and I am not aware that we have arrived at such a certain means of diagnosis as is implied in the statement.

Returning to Dr. Wilson Fox's report already read we find the following: "No other cysts could be found in the broad ligament." From this we conclude that he regarded the one under consideration as a cyst of the broad ligament, and Mr. Wells headed his case, "Non-adherent cyst of the broad ligament, &c." From what structures, then, did this or Dr. Meadows's cyst arise if not from the parovarium? Did they originate in a lymphatic vessel, or did they arise in the connective tissue? I assume as indisputable that all cysts lined by epithelium, and, in fact, all true cysts, take their origin in some cellular or tubular structure lined by epithelium, and they constitute the only form of cystic degeneration as distinguished from œdema of the connective tissue.

The relations of these cysts will vary according to their precise seat of origin. Thus, if the cyst arise in one of the tubules near the Fallopian tube, as on the right of the specimen, it will necessarily grow towards the tube rather

than the ovary, leaving a space of greater or less extent between itself and the latter, as in Mr. Wells' case (and specimen) or in Dr. Clay's case; if near the ovary it will seem to form part of that body, as on the left of the specimen, as well as in the specimen No. 2; * if in the long transverse tubule, which may be seen in the specimen extending as far as the side of the uterus, its relations will vary according to the point of origin. In parovarian cysts the Fallopian tube will usually be found lengthened out to a foot or more, as well as very much enlarged in calibre, as in the second specimen and in Mr. Wells' case. It is difficult even to conceive how the tube can be brought into such relations in the case of uncomplicated true ovarian disease. I would suggest as the probable source of these troublesome cases, as regards operation, in which the cyst separates the layers of the broad ligament and slips down by the side of the uterus, that they have originated in the transverse tubule above referred to. Of this nature would appear to be Dr. Keith's case, No. 73, which he describes as "a single cyst of the broad ligament coming off close to the uterus." I have seen several examples of this, and have felt that we wanted an intelligible and reasonable theory for their origin; but the frequent concurrence of ovarian disease with this has so obscured the subject that accurate conclusions were barely attainable. This theory satisfactorily accounts for them, and I offer it as a suggestion to future investigators.

In accordance with the facts already given and the views enunciated, we arrive at the conclusion that all unilocular cysts in the neighbourhood of the ovary, or involving it (by contact) though leaving it healthy, are of parovarian origin, and we are further driven to the conclusion, from considerations which will be adduced, that there is no such thing as true unilocular or *unifollicular* disease of the ovary, except in its earliest stage. It is true that we sometimes, though rarely, meet with an ovarian tumour consisting of one large cyst (specimen No. 3) with thick walls, having its inner surface marked by fibrous bands or a number of smaller cysts

* The specimens referred to in the paper were exhibited at the meeting.

projecting from its lining membrane ; but at no time could this be called true unifollicular disease. In these the whole of the ovary disappears so as to leave no trace of healthy structure. This is in accordance with what we might expect from a consideration of the anatomical characters of the organ. Assuming the disease to have its origin in a Graafian follicle (and we must remember that there are no Graafian follicles in the hilum of the ovary), we are asked to assume that only that portion of the ovarian coat which immediately overlies the imprisoned vesicle has become the seat of that hyperæmia and thickening which are believed, I may say allowed, to be the cause of its non-rupture, and to interfere with the natural course of events, while the remainder of the organ continues healthy and in functional activity. It follows from this that the true ovarian tumour, of size sufficient to be diagnosed during life, is always multiple. I believe also that the cases of so-called unilocular disease said to have been cured by the injection of iodine were not cases of true ovarian disease. Assuming them to be parovarian, we have a ready explanation of the successful results obtained in those cases in which the cysts yielded a clear limpid fluid, and which were alone regarded as suitable for this method of treatment. The remarks I have to make on the characters of the fluid of parovarian cysts will show how they correspond with these requirements.

That a deep-seated Graafian follicle undergoing cystic degeneration, and imprisoned superiorly and on every side by others in a similar condition, may, by continued pressure, and the traction of healthy tissues, tending to their separation by the continually increasing follicles, force its way through the firm tissue at the hilum of the ovary, so as ultimately to gain access to the tubo-ovarian fold of peritoneum, I am not prepared to deny ; but this admission does not answer the objection that in the case of unifollicular disease such a thing is impossible, or so improbable as to amount to impossibility. On the other hand, the theory of parovarian origin receives support from the preceding arguments, and is confirmed by the specimen before you, which shows a cyst

originating in one of the tubules of the parovary, which, by the necessity or accident of its position, has grown towards or involved the ovary separating the layers of the peritoneal fold in which it lies imbedded.

There is another peculiarity deserving of notice which further strengthens this view arising from the anatomical characters of the structures involved. In the case of true ovarian cystic disease it will be found exceedingly difficult to remove the external coat as a distinct layer, while in the parovarian it may be removed with the greatest facility, exhibiting an abundance of loose connective tissue. Dr. West has affirmed as a characteristic of parovarian cysts that they are incapable of division into layers. Now, the cysts before you, contradict this assertion in the most positive manner; for it will be seen that, in the case of specimen 1, the peritoneal coat has been separated from the cyst-wall to nearly a fourth of its extent by air which escaped between them in the attempt to inflate the sac, the point of the tube not having penetrated the sac. That incapability of division into distinct layers, and with facility, is characteristic of the multiple form of disease, I will not wait to prove. I will ask you to try the experiment on No. 3 and compare it with the other two. This is explained by the difficulty with which the ovary in its healthy state is deprived of its investing membrane. This is, in fact, impossible in an ovary which has been in functional activity for a few years, as will at once appear from the existence of the cicatrices.

When we bear in mind that the parovarium consists of a number of tortuous tubules, and that it does give rise to cystic disease, it becomes a matter of surprise that the disease of the organ should so often assume the monocystic form rather than the polycystic. That the latter does take place I believe the evidence furnished by specimen 2 will prove conclusive. For this also I am indebted to Mr. Spencer Wells. It was removed by that distinguished operator on the 14th February, and I regret that the specimen is not complete. It presented the same peculiarity as the cyst in No. 1 in that the ovary was adherent to it and perfectly

healthy, containing a recently ruptured follicle, which had been cut across in dividing the pedicle. It furnished a good example of the effects of the traction exerted by a growing body connected with it, for it was drawn out into an elongated form about double its usual length. The tumour consisted of two cysts, one holding thirteen pints and the other 12 oz. 6 drs. of a limpid, slightly opalescent fluid, of which a chemical examination was made for me by Dr. Divers, which is appended. The part of the ovary attached to it was removed by Dr. Leopold, of Leipzig, who was then in London, without injury to either of the cysts, and the tumour still shows in its site the trabecular structure which characterises the base of that organ.

In its recent state it very distinctly exhibited the boundary line, spoken of by Waldeyer and Leopold, separating the ovary from the cysts. The Fallopian tube courses round the outer aspect of the large cyst, and measures over a foot in length, while its diameter is so increased that at the fimbriated extremity it will admit the point of the finger. This is invariable in the case of the parovarian cysts, and is explained in this way. The cyst lying between the two layers of peritoneum, which constitute the tubo-ovarian fold, by its equal enlargement, the resistance being equal, grows towards both aspects, so that the tube crosses over the cyst for about one half its circumference, the edge of the fold, extending between the fimbriae and ovary, affording a fixed point on the one side, and the uterine end of the tube the other. Thus the tube may be likened to an elastic band half encircling an elastic bag to which its ends are attached. As the cyst grows it must either slip past the tube on one side or carry it along with it. As a rule, a sort of compromise is effected, for the tube does not keep the middle line exactly, but usually appears more on the anterior half of the tumour. Dr. Meadows's case answers these views to the very letter (see diagrams).

On the other hand, the tube seldom undergoes any change in the case of the true ovarian tumour, except such as can be effected by traction on the edge of the fold, and even then it

never exceeds six or eight inches in length, while it remains loosely attached in the greater number of cases.

It will be remembered that the ovarian coat is so intimately connected with the subjacent tissues, and so broken by cicatrices that it is impossible to remove it as a distinct layer, and there is no reason to assume that the diseased condition differs, in this respect, from the healthy. Now, in this instance the outer covering may be peeled off as readily as an orange is deprived of its skin, leaving a distinct sac internally with walls of considerable thickness. This peculiarity will, I believe, be found to be a diagnostic sign of extraovarian or parovarian cysts, and it is distinctly marked in the first specimen. I have seen Mr. Wells convert a sac in this manner into two, the outer having a portion of the ovary attached.

What, then, are the characters by which we can distinguish an extraovarian or parovarian from a true ovarian cyst? I believe the following will be found trustworthy :

Parovarian.

Peritoneal coat easily stripped off.

Ovary usually healthy and discharging its functions.

Tumour most frequently unilocular.

Fluid limpid, opalescent.

Sp. gr. very low, never exceeding 1010.

Mucine scanty.

Colloid always absent.

Fallopian tube almost invariably attached and stretched to several times its normal length.

Ovarian.

Peritoneal coat cannot be stripped off.

Ovary always diseased, and not discharging its functions.

Tumour always multilocular.

Fluid viscid, greenish, or brownish.

Sp. gr. always exceeding 1010.

Mucine abundant.

Colloid most frequently present.

Fallopian tube most frequently separate, seldom increased in length, and never exceeding six or eight inches.

*Chemical examination of the contents of a cyst received from
Dr. Bantock, February 23rd, 1872.*

Pale yellow and opalescent in bulk ; in small quantity, not sensibly so. Viscosity hardly apparent, but sufficient to make the fluid take a good froth. Faint mawkish odour only when warmed, mixed with that of carbolic acid. Specific gravity exceedingly low, being barely 1003·6. (Forty-eight grammes were found to be equal in volume to 47·83 grammes of distilled water, both taken at 60° F.) Reaction to *litmus paper* faintly alkaline. *Alcohol* of 95 per cent. in large quantity precipitated a small quantity of flocculi. *Heated* to boiling for some minutes, no precipitate or opalescence was caused unless sal ammoniac had previously been added ; a good quantity of flocculi was then thrown down (the sal ammoniac decomposes the albuminate of sodium, setting free the albumen). *Acetic acid* in minute quantity caused a slight opalescence, becoming a good flocculent precipitate on boiling. Both opalescence and precipitate almost completely dissolved by a little more acetic acid. *Nitric acid* in sufficient quantity gave a good flocculent precipitate. *Potassium ferrocyanide* gave no precipitate unless acetic acid had been added. *Corrosive sublimate* also gave none unless acetic acid had been added. In both cases the precipitate was then good. *Copper sulphate* gave a good precipitate, soluble in acetic acid. After boiling the fluid with sal ammoniac for some time and filtering off the flocculi of albumen the concentrated filtrate remained clear on addition of acetic acid, so that no appreciable quantity of *mucin* was present. The quantity of *albumen* obtained from fifty grammes (about thirteen fluid drams) was too small to be satisfactorily estimated.

The *conclusion* drawn from this examination is that the fluid was an unusually watery albuminous one, devoid of any other peculiarity.

Addendum.

Acetic acid.—After adding this in slight excess so as to remove the trifling opalescence at first produced the fluid

again became slightly opalescent on standing for two days, but no precipitate formed after even a longer interval. *Hydrochloric acid* (concentrated) caused gradually a not very marked opalescence, but no precipitate until it had stood for two days, when a slight one had formed, leaving the opalescence undiminished. *Corrosive sublimate* caused only gradually an opalescence a little more marked than that with hydrochloric acid, but no precipitate. But in two days a precipitate had formed, leaving the opalescence undiminished. Acetic acid now added gave increased opalescence, and in a short time the whole subsided, leaving the supernatant fluid quite clear. With acetic acid the fluid gave at once, with corrosive sublimate, a rapidly subsiding precipitate. *Copper sulphate* gave a good whitish precipitate partly soluble in free excess of the precipitant in the cold, entirely so on gently warming.

EDWARD DIVERS.

I am indebted to Dr. Junker for the very faithful drawing of the specimen, as well as for the diagrams which accompany this paper.



a. Uterus. *b.* Ovary. *c.* Parovarian cyst.



Diagram illustrating growth of parovarian cysts.
a. Ovary. *a'* Fallopian tube. *b.* Ovarian tunic. *c.* Peritoneum.
d. Cyst wall.

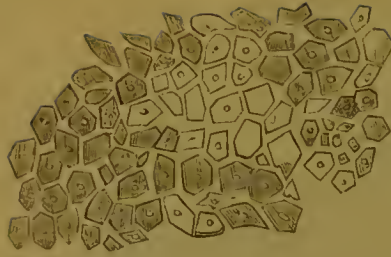


FIG. 1.—Superficial mosaic epithelium scraped from the ovary of a rabbit. 500 \times . (Leopold.)



FIG. 2.—Short cylindrical superficial epithelium from the ovary of a rabbit. *a*, Short-cylindrical; *b*, cuboid cells. 300 \times .

FIG. 3.—Ovarian epithelium, seen laterally. 500 \times . (Leopold.)

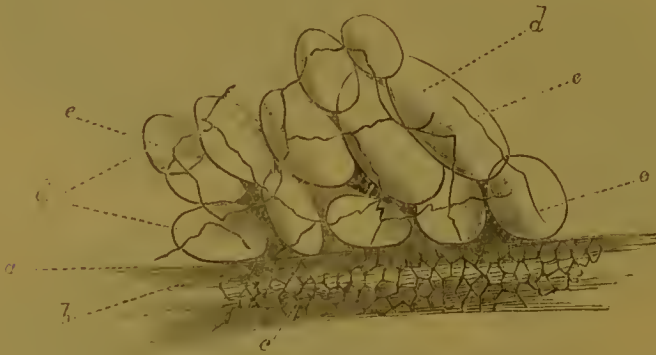


FIG. 4.—Ovary of rabbit, horizontal section. 300 \times . *a*, Boundary line; *b*, tract of connective tissue; *c*, mosaic epithelium of ovary; *d*, fat-cells; *e*, borders of the peritoneal epithelium (hardened in chromic acid). (Leopold.)

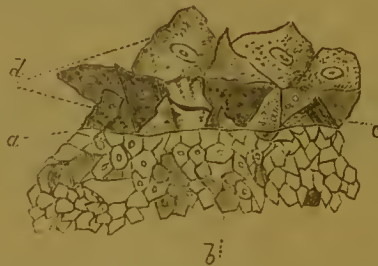


FIG. 5.—Ovary of rabbit, horizontal section. 300 \times . *a*, Boundary line; *b*, ovarian epithelium; *c*, ovarian epithelial cells without nuclei; *d*, with nuclei treated with nitrate of silver. (Leopold.)